PROPOSED NEW CLAIMS

24. A composite conductor for use as a winding of a high voltage electrical machine, comprising:

a) a plurality of strands of conductor material forming a conductor bundle which in cross-section is of generally rectangular shape, the strands being insulated from each other within the bundle;

b) an insulating sleeve of substantially homogeneous polymeric material surrounding the conductor bundle, the insulating sleeve also having a generally rectangular shape in cross-section, and the polymeric material being filled with at least one electrically insulating filler material which conducts heat more efficiently than the polymer alone; and

c) conductive material forming a corona shield coating at inner and outer surfaces of the insulating sleeve.

25. The composite conductor according to claim 24, the conductor bundle having radiused corners to minimize electrical stress concentrations.

26. The composite conductor according to claim 25, the corners having radius dimensions up to about 5 mm.

27. The composite conductor according to claim 26, the radius dimensions being between 2-3 mm.

28. The composite conductor according to claim 24, the insulating sleeve having substantially rectilinear corners.

29. The composite conductor according to claim 28, the corners of the insulating sleeve having a radius of not more than about 1 mm.

30. The composite conductor according to claim 24, the strands in the bundle of conductor material being collectively twisted around a longitudinal centerline of the conductor bundle, thereby to reduce winding losses from eddy currents.

31. The composite conductor according to claim 24, the at least one insulating filler material in the polymer insulating sleeve being at least one of a metallic oxide and a metallic nitride.

32. The composite conductor according to claim 24, the polymeric sleeve material comprising a high-temperature resistant polymer.

33. The composite conductor according to claim 32, the polymeric sleeve material comprising at least one of fluoropolymer and an aromatic polymer.

34. The composite conductor according to claim 24, the conductive coating material comprising at least one of a graphitic and a silicon based material.

35. The composite conductor according to claim 34, the conductive coating material comprising at least one of a high-temperature resistant polymer and a paint material which has sufficient of the conductive material incorporated therein to render it conductive.

36. The composite conductor according to claim 34, the conductive coating material being an extruded film.

37. The composite conductor according to claim 24, the conductor strands being insulated from each other by means of a high-temperature resistant insulating coating applied to each strand during manufacture of the strands before their incorporation into the conductor bundle.

38. The composite conductor according to claim 24, the conductor strands being insulated from each other by means of impregnation of the conductor bundle with a curable high-

temperature resistant insulating material during incorporation of the strands into the conductor bundle.

39. A process of making a composite conductor, comprising the steps of:

a) gathering together a plurality of strands of conductor material into a conductor bundle and twisting the bundled strands bodily about a longitudinal centerline of the bundle to form a twisted conductor bundle;

b) impregnating the conductor bundle with a curable high-temperature resistant insulating material, the impregnation occurring one of simultaneously with the gathering and twisting process and subsequent thereto;

c) applying a coating of conductive material to an exterior of the twisted conductor bundle to form a first, inner, corona shield;

d) extruding an insulating sleeve of homogeneous polymeric material onto the coating of conductive material on the conductor bundle, the polymeric material having been previously filled with at least one insulating filler material which conducts heat more efficiently than the polymer alone;

e) applying a coating of conductive material to an outer surface of the insulating sleeve to form a second, outer, corona shield; and

f) providing each strand of the conductor material with an insulating coating by at least one of coating the strands before the formation of the conductor bundle, and coating the strands during the impregnating step.

40. The process according to claim 39, in which after twisting of the bundle, the bundle is formed to a predetermined cross-sectional shape.

41. The process according to claim 40, in which the predetermined cross-sectional shape is rectangular.

42. The process according to claim 39, in which the impregnated conductor bundle is partially cured before the coating of conductive material is applied to the exterior of the conductor bundle.

43. A stator for a rotary electrical machine, comprising: a laminated steel core provided with a plurality of radially oriented slots extending longitudinally of the stator, each slot housing a winding comprising a plurality of turns of a single length of a composite conductor, successive turns of the composite conductor being in contact and in radial registration with each other, the composite conductor including

a) a plurality of strands of conductor material forming a conductor bundle which in cross-section is of generally rectangular shape, the strands being insulated from each other within the bundle;

b) an insulating sleeve of substantially homogeneous polymeric material surrounding the conductor bundle, the insulating sleeve also having a generally rectangular shape in cross-section, and the polymeric material being filled with at least one electrically insulating filler material which conducts heat more efficiently than the polymer alone; and

c) conductive material forming a corona shield coating at inner and outer surfaces of the insulating sleeve.

44. A stator for a rotary electrical machine, comprising: a laminated steel core provided with a plurality of radially oriented slots extending longitudinally of the stator, each slot housing a winding comprising a plurality of turns comprising a plurality of lengths of a composite

conductor, successive turns of the composite conductor being in contact and in radial registration with each other, the composite conductor including

a) a plurality of strands of conductor material forming a conductor bundle which in cross-section is of generally rectangular shape, the strands being insulated from each other within the bundle;

b) an insulating sleeve of substantially homogeneous polymeric material surrounding the conductor bundle, the insulating sleeve also having a generally rectangular shape in cross-section, and the polymeric material being filled with at least one electrically insulating filler material which conducts heat more efficiently than the polymer alone; and

c) conductive material forming a corona shield coating at inner and outer surfaces of the insulating sleeve.

45. The stator according to claim 43, the winding being retained in its slot by a high thermal conductivity, electrically insulating retaining means fixed in the radially outer end of the slot.

46. The stator according to claim 44, the winding being retained in its slot by a high thermal conductivity, electrically insulating retaining means fixed in the radially outer end of the slot.

47. A method of making a stator for a rotary electrical machine, comprising the steps of: providing a laminated steel core with a plurality of radially oriented slots extending longitudinally of the stator, each slot housing a winding comprising a plurality of turns of a single length of a composite conductor, successive turns of the composite conductor being in contact and in radial registration with each other, the composite conductor including a plurality of strands of

conductor material forming a conductor bundle which in cross-section is of generally rectangular shape, the strands being insulated from each other within the bundle, providing an insulating sleeve of substantially homogeneous polymeric material surrounding the conductor bundle, the insulating sleeve also having a generally rectangular shape in cross-section, the polymeric material being filled with at least one electrically insulating filler material which conducts heat more efficiently than the polymer alone; providing conductive material forming a corona shield coating at inner and outer surfaces of the insulating sleeve; in which the conductor bundle has been impregnated with a curable high-temperature insulation material and is wound onto the stator core while the curable high-temperature insulation material is only partly cured, attaching support means to the composite conductor where it is unsupported by the stator slots, and heat treating the completed stator to cure the curable high-temperature insulation material and produce a rigid stator winding.